Vermont Farm Methane Project Quarterly Report

Prepared by: Jeffrey W. Forward and Dan Scruton **January 10, 2001**

Introduction:

The Vermont Department of Public Service (DPS) and the Vermont Department of Agriculture (AGR) have received a total of $695,000 from appropriations from the federal budget over the past several years to promote the use of methane recovery technology on Vermont dairy farms. This technology has the potential to help farmers with their nutrient management plans and at the same time provide additional on-farm income. The goal of this project is to identify and help overcome key strategic hurdles to widespread adoption of methane recovery technologies by Vermont farmers.

The project was designed to consider methane recovery in a broad context, taking into account its potential benefits as a component of a comprehensive nutrient management system, as a renewable energy source and as a strategy for greenhouse gas reduction. The implementation plan calls for using one third of the money for project administration and outreach, one third toward research and development and one third to be used for cost share of installations.

PROJECT ACTIVITIES September 30, 2001 - December 31, 2001

ORGANIZATIONAL:

Biomass Energy Resource Center, Inc.

This past quarter the Vermont Methane Project established a part time staff position at the Biomass Energy Resource Center (BERC) that will be specifically devoted to this project. BERC recently incorporated as a not-for-profit private corporation with the mission of promoting and developing biomass energy projects. This is a project oriented organization that hopes to work on biomass projects in Vermont, the Northeast and globally. Vermont has considerable experience in small and medium scale biomass projects and the goal of this organization is to export that expertise by facilitating specific projects.

BERC has found and is working with two interns from the University of Vermont. One intern is working with Jeff Forward. He will assist in developing a cost analysis on the concept of group net metering for several farm scenarios. The other intern will work with Dan Scruton to gather and analyze data at the Foster Bros. research site. Both of these interns will be contracted through BERC.

Project Advisory Committee:

A Project Advisory Committee meeting was held on October 19, 2001. Attached is an agenda and minutes from that meeting.

RESEARCH AND DEVELOPMENT

Foster Bros. Dairy Farm research and demonstration site:

Foster Bros. have a two chambered side-by-side digester that they have been using successfully for over 15 years. The Vermont Methane Project has isolated these into two separate digesters so that we can experiment with various materials and technologies and still maintain a control that we know works. Fosters began loading the digester in December of 2000 and has been producing biogas generated electricity since January 2001.

This past quarter was spent organizing a trial research run. Manure samples were tested and protocols discussed. There are still some hurdles to be overcome but we should be ready to start trails in the first quarter of 2002. We are hoping to develop technologies that will reduce the retention time by over 50%. This will in turn reduce installation costs. We will be organizing with Foster and the intern to run trials. We need to do an initial trial to get the bugs out of the data collection and gather baseline data. Dan Scruton, Stan Weeks (engineering consultant) and Peter Wright (Cornell University) will be using this data to start other trials. We believe that thermophilic digestion can be achieved and retention times may be able to be reduced to less than a week (currently 20 days is standard).

Feasibility Studies / Inquiry follow-ups:

We are actively working with one 800 cow farm on an engineering design. As we get more estimates will be doing a more exact feasibility to help the farm family with their decision. (See more detail of project under Site Specific Engineering below)

We have also had many preliminary contacts with a variety of farms and potential sites for anaerobic digesters. These contacts include:

- A 100 cow farm that has a variety of ancillary buildings and businesses associated with it. This may be a particularly attractive demonstration site since it is located in southern Vermont with easy access and the organization that owns the farm has already established the farm as a demonstration farm to some degree.
- We have begun preliminary discussions with a composting organization that is looking to expand. One possibility might be to site a composting facility in conjunction with a an anaerobic digester to process agricultural byproducts. This could be a cost effective alternative if the energy produced from this facility could be used in an adjacent industrial park. We are discussing possible sites with several municipalities.
- A citizen group in Vermont is considering an industrial park that will be partially powered by the manure from farms in the area. Over the next quarter they will be doing some preliminary economic analysis to see if the idea is worth pursuing. Dan met with them and is helping them through the decision making process. A cooperative manure storage may be both environmentally advantageous and provide a significant energy source.
- Several farms contacted the project over past few weeks and Dan will be visiting them to see if they are potentially viable sites.

Site Specific Engineering Studies:

We have begun to design on a comprehensive system for an 800 cow dairy farm in Addison County. The farmer has committed to working with us through the design phase. Natural Resources Conservation Service and the Otter Creek Natural Resources Conservation District is partnering with us on this project. The over-all project includes both a digester, and an in-vessel rotary composter.

Under the current design, the system will intercept the manure from the milking barn and separate the manure into liquid and solid fractions. This leaves two materials that are each easier to use than the original slurry. The liquid will go to a storage tank with a 2 day capacity that will be "spiked" with liquid coming from the digester to enhance the number of methane producing bacteria in the liquid. This should reduce the retention time to around 7 to 10 days. The liquid will then pass through a pair of heat exchangers and enter a silo-like storage vessel. The first will pre-heat the liquid going to the digester by drawing heat from the liquid coming out of the digester. The second exchanger will add the additional temperature to bring the liquid entering digester to 100 degrees F. The system will have provisions for thermophilic operation if needed to further reduce retention time.

The solid stream will be turned into compost. Part of the solids will go into an in-vessel composter that composts at 140 degrees F for 3 days. The plan includes a controlled study on the use of composted manure solids as a substitute for traditional bedding. The high temperatures achieved will kill all of the pathogens of concern. The remaining solids will initially be composted with a tradition winrow system.

The engineering has started and initial drawings are underway. The unique features on this system will improve the overall efficiency and automate the operation as much as practical. We have started to get specific estimates for part of the construction. We hope to complete these plans and estimates the first quarter of 2002. The farmer will then be able to make a final decision on completion.

POLICY INITIATIVES:
Group Net Metering:

The Vermont Methane Project managers participated in a number of events organized by the VT Department of Public Service this past quarter in order to develop the Governor's Energy Initiative (See attached description). One policy initiative that is particularly relevant for this project is a legislative proposal to authorize group net metering. Group net metering is a concept where several different customer accounts could be grouped together to offset small scale renewable energy generation. This concept could work particularly well for farm based methane because it is not unusual for a farm to pay several different electric bills. We are preparing an analysis of the impact this concept might have for different farm scenarios.

Emissions Trading:

The Vermont Methane Project has met with Native Energy, Inc. to discuss the possibility of using farm based methane "Green Tags". Green Tags is a notion where the environmental benefits of a particular generation source are marketed to consumers for a premium. In this case, farm based methane might offset conventional generation sources with their associated environmental impacts as well as reduce the amount of methane released in the atmosphere. Since naturally occurring methane is a significant greenhouse gas, using that gas could have a significant environmental benefit. Native Energy is interested in negotiating a contract with a farm to purchase and sell these environmental benefits to consumers through "Green Tags". The Vermont Methane Project is exploring what the risks and benefits of such a strategy might be from the producers perspective.

OUTREACH:

Tours:

One of the benefits of setting up our research project at Foster Brothers Farm in Middlebury is that it is an excellent demonstration site. The Fosters have nearly 20 years of experience with this technology and related systems and they are very excited about some of the experiments we are performing there. These tours allow us to display some of our experimental technologies and it gives us a good opportunity to discuss with other individuals, groups and organizations possibilities for collaboration.

Over the past quarter, we coordinated one such tour with the director of the Fraunhofer Center for Energy and Environment, a German research and development organization that has an institute associated with the University of Pittsburgh, PA. They have developed an anaerobic digestion technology and are interested in partnership opportunities for either a research project or commercialization of their technology. Peter Wright from Cornell University also toured the facility and will be working with us on coordinating the type of data we gather so that our research and that done in NY will be easily compared and we can both learn from each others data. He is also interested in collaborating with us on some projects.

Out-of-state Outreach

Dan Scruton traveled to Syracuse, NY on Nov. 13 and 14 to participate in a conference sponsored by NYSERDA on Energy Innovations in Agriculture. (See attached brochure.) He presented at a session that highlighted digester questions, issues and answers. This type of outreach is valuable both in terms of education to other farmers, and by exchanging ideas we can use to improve our projects.

Jeff Forward participated in the Agri-Energy Conference in State College PA on November 12 and 13 sponsored by the West Penn Power Sustainable Energy Fund. He presented an overview of the VT Methane Project to date in a session entitled, *Lessons Learned, What's Working* (see attached presentation slides.) In addition to presenting, Jeff made several significant contacts including the Fraunhofer Center and the National Energy Technology Laboratory. He will follow-up on these contacts during the next quarter.

For more information on the Vermont Farm Methane Project contact:

Jeff Forward
Biomass Energy Resource Center, Inc.
PO Box 615
Richmond, VT 05477
(802) 434-3770
FAX: (802) 434-2344
forward@sover.net

Dan Scruton
Vermont Department of Agriculture
116 State Street
Drawer 20
Montpelier, VT 05620-2901
828-3836
dan@agr.state.vt.us

Attachments:

- Summary of the Governor's Energy Initiative.
- Agenda and meeting notes from October 19 Advisory Committee meeting.
- Conference Handout from Agri-Energy Conference sponsored by the West Penn Sustainable Energy Fund on November 12 and 13 in State College Pennsylvania

- Presentation slides from Agri-Energy Conference
- Workshop agenda from Innovations in Agriculture Workshop sponsored by NYSERDA on November 13 and 14 in Syracuse, NY.
- Corporate description of the Fraunhofer Center for Energy and Environment in Pittsburgh
- Corporate description of Native Energy